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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/803,614	03/18/2004	Thorsten Rohwer	8540G-000136 (GP-302246)	5878
27572	7590	08/17/2006	EXAMINER	
HARNESS, DICKEY & PIERCE, P.L.C. P.O. BOX 828 BLOOMFIELD HILLS, MI 48303			ECHELMAYER, ALIX ELIZABETH	
			ART UNIT	PAPER NUMBER

1745

DATE MAILED: 08/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/803,614	<b>Applicant(s)</b> ROHWER ET AL.	
	<b>Examiner</b> Alix Elizabeth Echelmeyer	<b>Art Unit</b> 1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 07 June 2006.
- 2a) ☒ This action is **FINAL**.      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-21,23 and 24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-21,23 and 24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Response to Amendment***

1. This action is in response to Applicants' reply filed June 7, 2006. Claims 1, 11, 14 and 16 have been amended. Claim 22 has been cancelled.

### ***Claim Objections***

2. Claims 23 and 24 are objected to for being dependent on a cancelled claim. For the purposes of this Office Action, they will be interpreted to be dependent on claim 16.

### ***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 14 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear what amount of pressure is "a capillary delivery pressure."

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-3, 10-21, 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nelson et al. (US Patent Number 6,150,049) in view of Ouvry et al. (US Patent Number 6,444,347) in further view of Lloyd et al. (US Pre-Grant Publication 2004/0086775).

Nelson et al. teach a hydration system for a polymer electrolyte membrane (PEM) fuel cell having fluid flow plates with fluid openings into flow channels (abstract; column 2 lines 48-60). Nelson et al. also teach the layers of a fluid flow plate, the anode, the membrane electrode assembly (MEA), the cathode, and another fluid flow plate. In this invention, the gas diffusion layer of the MEA is made of carbon cloth or carbon paper (Figure 3; column 5 lines 26-65).

Nelson et al. fail to teach the gas diffusion medium between the plate and the MEA having a hydrophobic layer adjacent the plate and a hydrophilic layer adjacent the MEA.

Ouvry et al. teach an electrode made of a hydrophilic carbon fiber cloth having coatings on either side. On the outside, adjacent the fluid flow plate, is a microporous polytetrafluoroethylene (PTFE) layer that creates a layer having hydrophobic characteristics on the carbon cloth. On the opposite side is a layer carrying the catalyst for the reaction of the fuel cell within which this gas diffusion media is contained (Figure 1; column 4 lines 62-67; column 5 lines 1-6).

The use of the gas diffusion membrane of Ouvry et al. in a PEM would allow greater control of the hydration system because the layers having either hydrophobic or

Art Unit: 1745

hydrophilic characteristics are arranged in a manner that controls how water flows throughout the membrane, not just whether and where it flows into the membrane as the fuel cell assembly of Nelson et al. teaches.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the gas diffusion layer of Ouvry et al. in the fuel cell of Nelson et al. in order to provide better control of the hydration of the fuel cell.

Nelson et al. in view of Ouvry et al. fail to teach in-plane and cross-plane variability of hydrophobicity or hydrophilicity.

Lloyd et al. teach a hydrophobic layer of a gas diffusion layer for a fuel cell having variable hydrophobicity in the x-, y-, and z-directions. Further, Lloyd et al. teach that the outer hydrophobic layer is porous and that the porosity is variable (Figure 9, [0045]).

The pores of the hydrophobic layer of Lloyd et al. anticipate the capillary element of claims 1 and 16. The pores facilitate the transportation of reactant or water through the layer, and if this layer were used in the combination of Nelson et al. and Ouvry et al. above the pores would allow for transportation of water and would terminate at the end of the layer since the layers are autonomous.

Lloyd et al. teach that having variable hydrophobicity and porosity provides for substantially optimal hydration for the regions of the ion exchange membrane, which have a different surface temperature and operational hydration requirements ([0014]).

As for claims 11 and 14, the porous layer of Lloyd et al. is adjacent the water flow fields of the separator plate of Nelson et al., so the water in the plates would be

transported to the porous channels formed in the hydrophobic layer of Lloyd et al. by capillary action.

Regarding claims 12, 13, 23 and 24, the capillary element as taught by the pores of Lloyd et al. provides a via in the porous structure and, in combination with Nelson et al., provides a hydrophilic layer on the surface of the hydrophobic layer.

It would be advantageous to have variable hydrophobicity and porosity in order to provide optimal hydration for the ion exchange membrane.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use make the hydrophobic layer of Ouvry et al. variable hydrophobic in order to provide optimal hydration for the ion exchange membrane.

6. Claims 4-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nelson et al., Ouvry et al. and Lloyd et al. as applied to claim 1 above in further view of Imahashi et al. (US Patent Number 5,350,643).

The teachings of Nelson et al., Ouvry et al. and Lloyd et al. as discussed above are incorporated herein.

Nelson et al. in combination with Ouvry et al. teach a PEM having a gas diffusion assembly with a hydrophobic layer adjacent the fluid flow plate and a hydrophilic layer adjacent that hydrophobic layer.

Nelson et al. with Ouvry et al. fail to teach variability of hydrophobicity and hydrophilicity in the cross-plane and in-plane directions of the hydrophobic and hydrophilic layers.

Imahashi et al. teach water-repellency concentration gradients along layers of hydrophobicity and hydrophilicity. Imahashi et al further teach that the performance of fuel cells can be markedly improved by this gradient of water-repellent concentration (column 7 lines 37-67; column 8 lines 1-8).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have vary the ability of a layer to repel or attract water in the layers of Nelson et al. in view of Ouvry et al. as taught by Imahashi et al. because Imahashi et al. teaches that such a gradient can improve the performance of the fuel cell.

### ***Response to Arguments***

7. Applicant's arguments have been considered but are moot in view of the new grounds of rejection.

### ***Conclusion***

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alix Elizabeth Echelmeyer whose telephone number is 571-272-1101. The examiner can normally be reached on Mon-Fri 7-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Alix Elizabeth Echelmeyer  
Examiner  
Art Unit 1745

aee

**GREGG CANTELMO**  
**PRIMARY EXAMINER**

A handwritten signature in black ink, appearing to read "Gregg Cantelmo", written over the printed name and title.